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EXTERNAL MIRROR FOR MOTOR VEHICLES

Background of the Invention

The invention is generally related to an external mirror for motor vehicles, especially for trucks or buses. The invention is more particularly related to an external mirror having unitary housing design to which various elements are readily secured.

External mirrors of various constructions have been made. Typically, external mirrors include a housing integrated with a vehicle body in some way, a mirror plate, and a swivelling mechanism inserted between the mirror plate and the housing for positioning and securing the mirror plate in an adjustable manner relative to the housing. The housing is typically an injection molded part made of heavy plastic, which is generally shaped as a trough, to which mirror elements are installed over corresponding mounting points. In order to provide the housing with necessary stability, expensive ribs and reinforcements are necessary. Moreover, the mounting points -- for instance, screw collets, entry borings, and the like -- are installed for additional mirror parts by means of relatively costly molding tool work on the housing.

For large trucks and bus mirrors, very often tubular or plate designs are employed for the support means of the external mirrors, which are directly integrated with the mirror holder extending from the vehicle body (see, for example, EP 0 590 510 A1). The housing serves in this case only not as a cover for the back side of the mirror plate and the swivelling mechanism, but also as an aerodynamic sheathing for the external mirror. Such designs are extremely expensive and heavy.

Known multiple unit mirrors employ a complex grating type tube design, upon which the housing is

simply set as a sheathing thereover. The mirror, is thus weighty and can only be produced at a high cost. In particular, the molding equipment for the production of the sheathing portion is very complex and hence expensive.

Objects and Summary of the Invention

It is accordingly an object of the invention to provide an external mirror addressing and solving the above drawbacks and others of the prior art.

It is an additional object of the invention to create an external mirror that is simple and inexpensive to manufacture and assemble, and a corresponding method of assembling the external mirror.

It is another object of the invention to provide a mirror that is stable and resistant to vibration.

These objects and others are achieved by the features and corresponding method steps described and explained below. The invention provides a housing that is a self supporting, integral shaped piece from a single foam core with a reinforcing layer that covers the core. The invention provides a simple manufacture, high shape stability, minimum vibration sensitivity, and low weight. Very complex basic housing shapes can be made, as well as very large housings. These advantages will be discussed in detail below with reference to particular preferred embodiments.

Polyurethane material has been selected as a preferred plastic substance for the foam core and the reinforcing layer which is applied thereon. It suffices for the installation of the mirrors and for the related swivelling mechanism, generally, to allow for a basin shaped reception recess in the housing. In this design, the mirror plate is installed with the swivelling mechanism and, for example, affixed to the housing for a long term period by plastic tapping

screws or an appropriate adhesive. Special screw collets or penetrating borings, as used in conventional devices, are not necessary, substantially reducing the technical forming process.

Due to the filling of the housing by foam material, it is possible, even during the formation of the housing, to embed within the foam core, for instance, fittings for the attachment of the housing on to the body of the motor vehicle, holder bases for the fastening of the swivelling mechanism to the housing, and cable and/or empty tubing for the electrical system, the positioning control, and the heating of the mirror plates. This too reduces the amount of the production costs for the external mirror itself and the expense of the final mounting on the vehicle. The housing can also be penetrated by an opening through the foam core, so that the housing is mountable on a retaining arm for the mirror.

The multiple unit mirror embodiment according to the present invention includes a self supporting housing, which not only serves as the support structure, but also as the sheathing of the mirror plates within the respective swivelling mechanism. The housing can be made with a relatively simple molding set up, whereby the molding costs are substantially reduced. Because of its integral structure and the stability of shape along with low response to vibration provided by the integral structure, the corresponding multiple unit mirror is well-suited for use on vehicles such as busses.

Brief Description of the Drawings

Further features, details, and advantages of the invention can be inferred from the following description in which preferred embodiments of the

invention are discussed with reference to the following figures:

Fig. 1 is a side view of the external mirror according to a first embodiment of the invention.

Fig. 2 is a horizontal section through the mirror along line II-II of Fig. 1.

Fig. 3 is a longitudinal section through a multiple unit mirror according to a second embodiment of the invention.

Detailed Description of the Preferred Embodiments

Reference will now be made in detail to the presently preferred embodiments of the invention, one or more examples of which are illustrated in the accompanying drawings.

The exterior mirror presented in Figs. 1 and 2 includes a housing 1, the outside contour of which exhibits the convexly cambered profile common to truck mirrors. The housing 1 is designed as a self supporting, integrally shaped piece, which is made out of a one-piece foam core 2 and a reinforcing layer 3 which totally envelopes the foam core 2. The foam core 2, which is preferably a polyurethane substance, is expressed out of an appropriate molding apparatus, and subsequently the reinforcing layer 3 (also preferably polyurethane) is sprayed thereon. The reinforcing layer 3 congeals into a smooth outer skin of a few millimeters thickness, which, together with the foam core 2, lends the necessary stability to the housing and makes it weather resistant. At the same time, the reinforcing layer 3 can be lacquered or painted to conform with the outer color of the vehicle which is being provided with the mirror. The foam core 2 and the reinforcing layer 3 are preferably comprised of polyurethane substances which can be easily chosen by persons skilled in the art.

As is particularly made clear in Fig. 2, the housing 1 includes on side 4, which is turned away from the direction of travel "F," a receiving recess 5 having an opening 6 in which the mirror plate 7 is installed with an all-around clearance "a" from the stiffening surface of collar 8 of the housing which lines the recess 5. The mirror plate 7 is affixed to a plate shaped mirror carrier 9, for example, by mechanically locking or securing with adhesive. The mirror carrier 9 is fastened to a holding plate 11 by a clamping connection, as is described in the German Patent Application P 43 02 950.7 (which corresponds to U.S. Patent Application Ser. No. 08/245,952). The holding plate is bound to the housing 1 by means of a swivelling mechanism denoted generally by 12, whereby the mirror plate 7 is installed in the housing 1 in a swivelable manner.

The swivelling mechanism 12 is designed as a ball joint, whereby a bearing shell 13 of the ball joint is integrally formed as part of a socket piece 14. A side wall portion 15 of the socket piece 14 extends from the bearing shell 13 with a conical frustum shape that terminates in a ring shaped, encircling collar 16. As shown in Fig. 2, the collar 16 and the adjacent portions of walls 15 of the socket 14 are embedded within the foam corr. 2 of the housing 1, whereby a firm connection between the socket 14 and the housing 1 is achieved. The foam material, in this arrangement, completely fills the inner volume of the socket 14.

The bearing shell 13 includes in its one-piece construction a centrally located, axially protruding threaded sheath 17 within which a securing screw 18 holds a thrust bearing cap 19 in place on the end of the threaded sheath 17. In the interior of the thrust bearing cap 19 is compressed a spring 20, which acts

against a spherical segment shaped detent element 21 in the direction of the bearing shell 13 of the swivelling mechanism 12. Between the detent element 21 and the bearing shell 13 is a hemispherical opposed bearing shell 22 fitted on the holding plate 11 for the mirror holder 9. The opposed bearing shell 22 includes a central opening 23 through which, with some play, the threaded sheath 17 penetrates.

As may further be made clear from Fig. 2, the housing 1 includes a vertical opening 24 extending through the housing by means of which the housing 1 can be mounted on a tubular holding arm 25. The housing 1 can be stably bound to the holding arm 25 by screws which are not shown.

The exterior mirror depicted in Fig. 3 is designed as a multiple unit mirror, the housing 1' of which runs in a somewhat quarter-circular arc, viewed in a plane parallel to the ground, and with substantially vertical surfaces (vertical to the drawing plane of Fig. 3). The housing 1' is made from a foam core 2 and a reinforcing layer 3 which envelopes the foam core 2. In the concave inner side 26 of the housing 1' are three mirror assemblies 27 arranged next to one another covering some 2/3 of the length of the arc of the housing 1'. Extending from this section, called the "mirror zone 28," of the housing 1' is found an anchoring segment 29, the end 30 of which, i.e. the end of the exterior mirror, is affixed to a bus. To make clear this installation of the exterior mirror on the bus, the latter is indicated by dotted lines, whereby in Fig. 3 the forward roof end 31, the so-called A-column 32 of the bus body, and the front pane 33 are recognizable.

The mirror assemblies 27 are placed once again in the respective receiving recess 5 in the housing 1'.

Each mirror assembly 27 includes swivelling modules 34 held respectively in place on the innermost wall 35 of the recess 5 by means of plastic self tapping screws 36. The swivelling modules 34 are of conventional construction and possess integrated swivelling motors. On the side of the swivelling module 34 remote from the back plate 35, a holding plate is installed as before, upon which the mirror carrier 9 of the mirror plate 7 is fastened by means of the mentioned clamping connection 10. The mirror plates 7 lie again in the area of the opening 6 of the receiving recess 5.

In the anchoring segment 29 of the housing 1', a gable shaped fitting base 37 is embedded in the foam core 2 of the housing 1', whereby an anchoring plate of the fitting base 37 is enveloped by the foam core 2 on all sides, and by means of the openings 39 is penetrated by the foam core 2. In this way, an intimate connection between the fitting base 37 and the foam core 2 is achieved. Extending from an anchoring plate 38 are two side bars 40, 41, which are surrounded by the foam core on the outer surfaces. Between the opposing inner sides of bars 40, 41, the foam core is excised (cut-out 43) so that the two side bars 40, 41 of the fitting base 37 can be pushed on to a support bracket 42 on the forward roof end 31 of the bus body and subsequently affixed this with screws. Thus, a simple yet stable securement of the external mirror to the body is guaranteed.

As is further made clear from Fig. 3, in the foam core 2 of the housing 1', empty tubes 44 made of thin, stable shaped hose are embedded, which generally run from the cutout 43 to the receptacle recesses 5 with the terminal end opening in the area of the back plate 35. Electrical power lines and control cables can be run through these tubes 44 to serve the swivelling

module 34 and possibly a mirror heating means if such is provided. Again the wiring of these electrical components can be carried out with ease. As an alternative, the cables can be embedded directly in the foam core 2 by laying the cables in the molding equipment.

It should be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope and spirit of the invention. It is intended that the present invention includes such modifications and variations as come within the scope of the appended claims and their equivalents.

What is claimed is:

1. An external mirror for motor vehicles comprising:

a housing including a one-piece foam core and a reinforcing layer enveloping the core;

at least one mirror plate; and

a swivelling mechanism secured to the mirror plate and embedded within the core of the housing for movably positioning the mirror plate relative to the housing.

2. An external mirror as recited in claim 1, wherein the core and the reinforcing layer include polyurethane.

3. An external mirror as recited in claim 1, wherein the housing includes at least one recess in which the mirror plate and the swivelling mechanism are secured.

4. An external mirror as recited in claim 1, further including a fitting piece embedded in the core for securing the housing to the vehicle.

5. An external mirror as recited in claim 1, wherein the core of the housing defines an opening extending therethrough, the mirror further including an arm extending through the opening for attaching the mirror to the vehicle.

6. An external mirror as recited in claim 1, wherein the swivelling mechanism includes a socket portion embedded in the core and a bearing shell portion pivotably secured to the socket portion and fixedly secured to the mirror plate.

7. An external mirror according to claim 1, further including tubing for receiving cables for controlling functions of the mirror plate embedded within the core.

8. An external mirror according to claim 1, further including cables for controlling functions of the mirror plate embedded within the core.

9. An external mirror according to claim 1, wherein the at least one mirror plate includes a plurality of mirror plates and the external mirror includes a plurality of swivelling mechanisms respectively connected, the housing including a concave interior in which the mirror plates and swivelling mechanisms are arranged.

10. A method for manufacturing an external mirror for vehicles comprising the steps of:

molding a housing;

embedding at least one swivelling mechanism in the housing during the molding step; and

attaching a mirror plate to the swivelling mechanism.

11. A method as recited in claim 10, wherein the molding step includes the sub-steps of:

molding a core; and

applying a reinforcing layer to a surface of the core.

12. A method as recited in claim 10, further including the step of embedding a fitting piece for securing the mirror to the vehicle in the housing during the molding step.

13. A method as recited in claim 10, wherein the molding step includes providing an opening extending through the housing for receiving a bar for securing the mirror to the vehicle.

14. A method as recited in claim 10, wherein the embedding step includes the sub-steps of:

embedding a socket portion of the swivelling mechanism in the housing; and

securing a bearing shell portion of the swivelling mechanism to the socket portion.

15. A method as recited in claim 10, further including the step of embedding tubing in the housing for receiving cables for controlling functions of the mirror plate.

16. A method as recited in claim 15, further including the step of placing the cables in the tubing.

17. A method as recited in claim 10, further including the step of embedding cables in the housing for controlling functions of the mirror plate.

18. A method as recited in claim 10, wherein the embedding step includes embedding a plurality of swivelling mechanisms, and the attaching step includes attaching a plurality of mirror plates, a respective one of the mirror plates being attached to a respective one of the swivelling mechanisms.

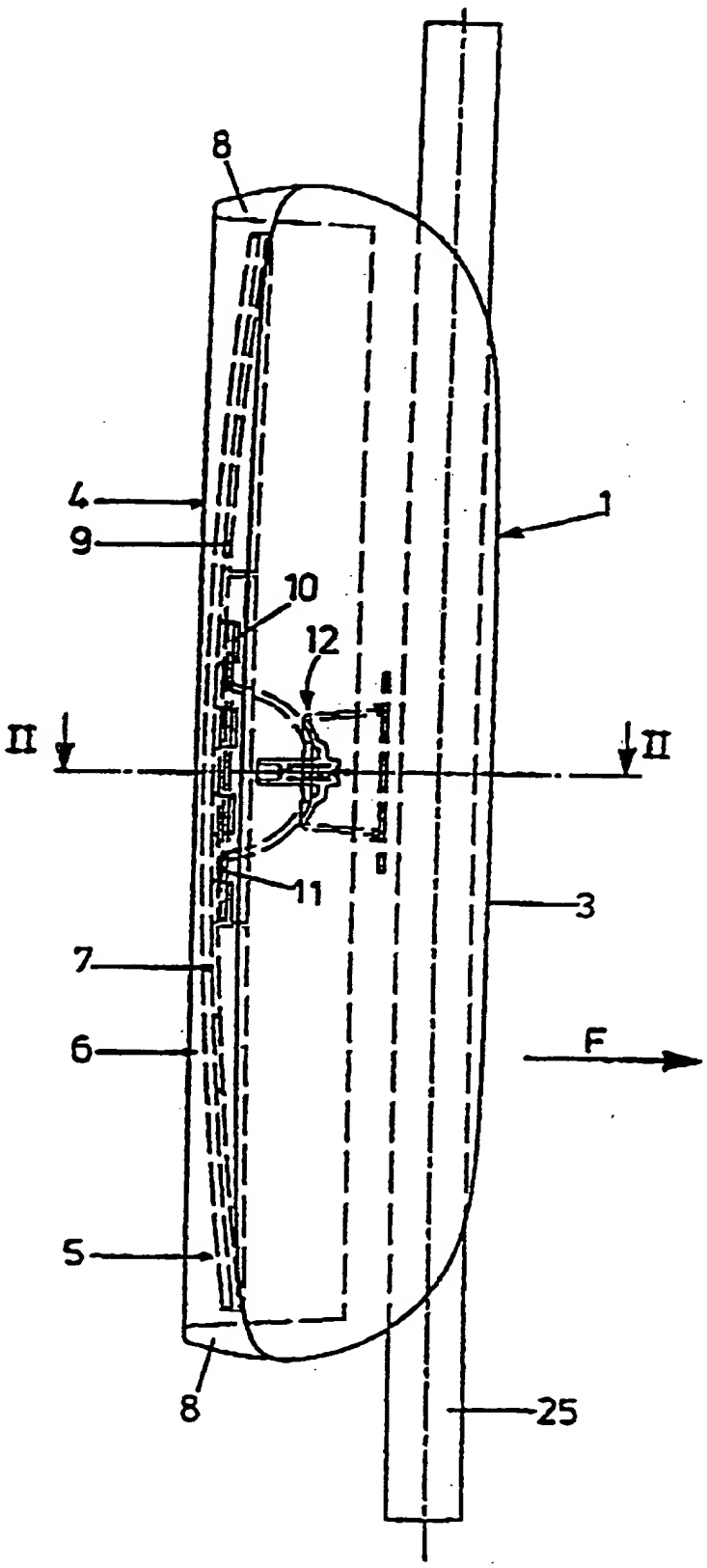

FIG. 1

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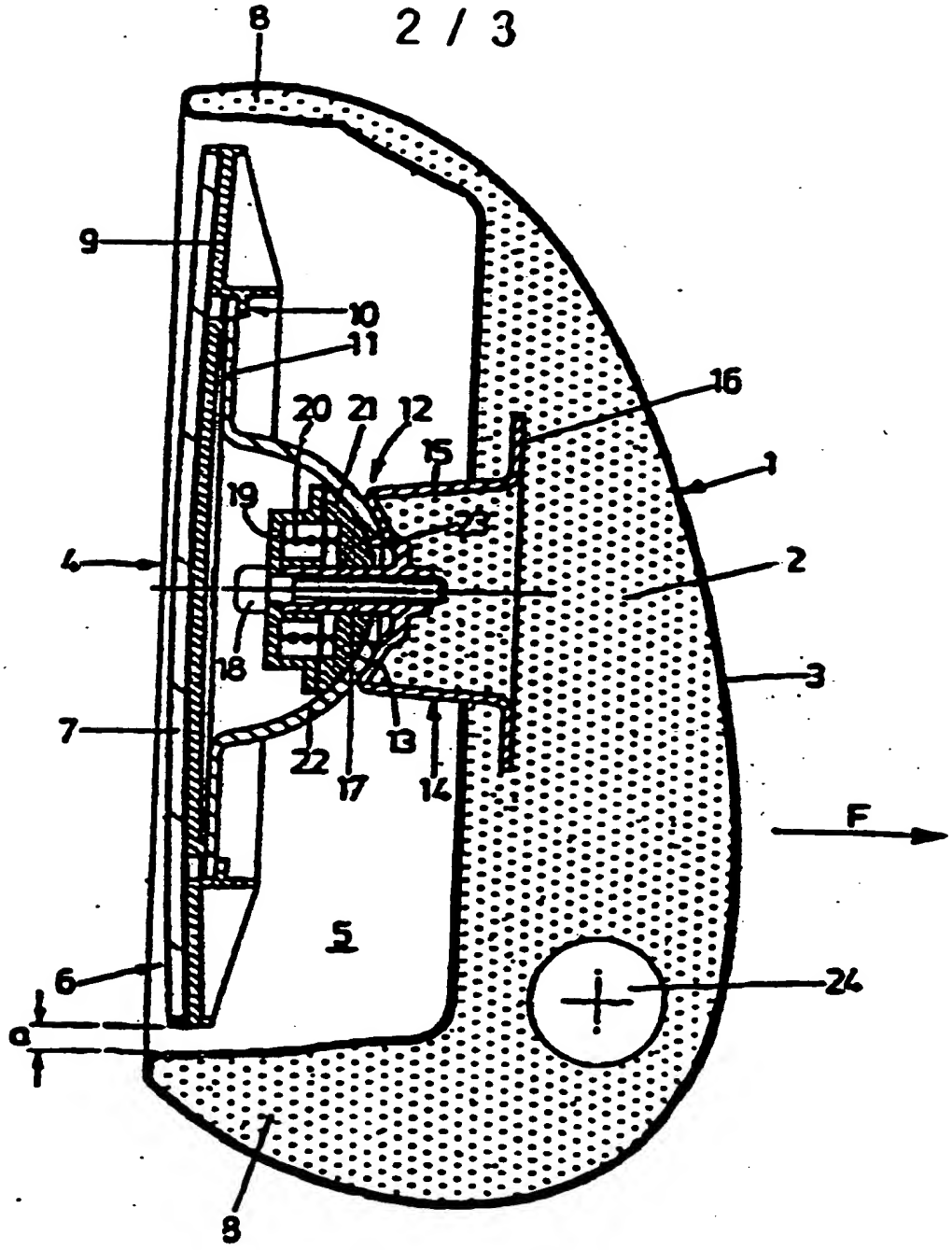

FIG. 2

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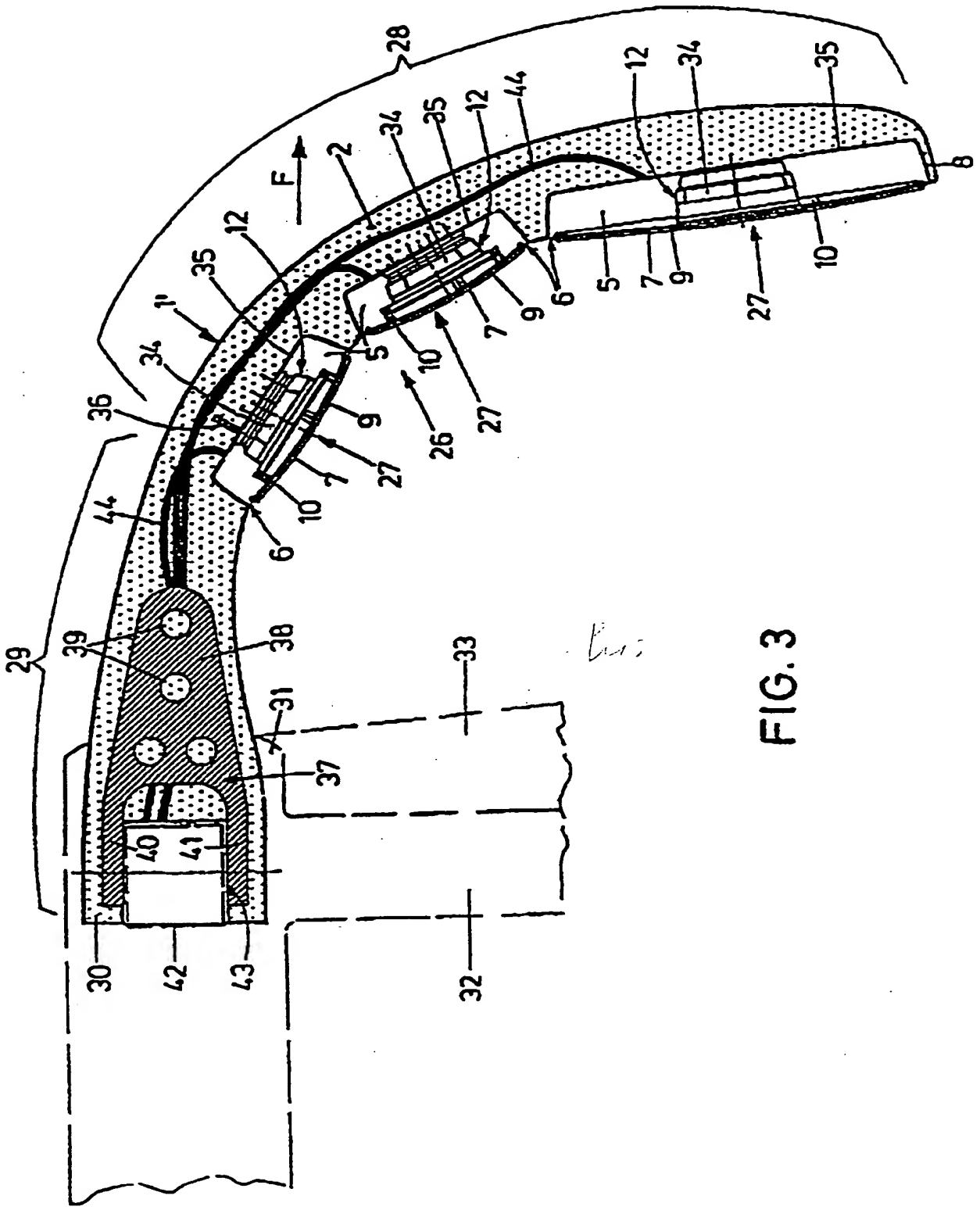

FIG. 3

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